

Amendments to the Claims

This listing of claims will replace all prior versions, and listings of claims in the application:

Listing of Claims:

1-19. (cancelled without prejudice)

20. (new) A radio base station apparatus provided with an array antenna having a plurality of antenna elements, comprising:

a probe signal adding unit which adds a probe signal to each of receive signals received by said plurality of antenna elements;

a probe signal extracting unit which extracts the probe signal from said receive signals added with the probe signal;

a phase calibration calculation unit which calculates phase calibration required for calibrating a phase of each receive signal based on the probe signal extracted by said probe signal extracting unit; and

a phase calibration unit for calibrating said phase of the each receive signal based on the phase calibration from said phase calibration calculation unit.

21. (new) The radio base station apparatus according to Claim 20, wherein:
said probe signal extracting unit comprises a despreading unit which despreads

the receive signals added with said probe signal to extract said probe signal.

22. (new) The radio base station apparatus according to Claim 21, wherein:

said probe signal adding unit comprises:

a probe signal generating unit which spreads probe data with

a predetermined spread code to generate the probe signal

a conversion unit which converts said probe signal to a radio signal; and

a coupling unit which couples the probe signal converted to said radio signal

and said receive signals; and

said despreading unit performs despreading on signals outputted from said coupling unit, using the same spread code used in said probe signal generating unit, in order to extract the probe data; and

said phase calibration calculation unit calculates the phase calibration required for calibrating the phase of each receive signal based on the probe data extracted by said despreading unit.

23. (new) The radio base station apparatus according to Claim 22, wherein:

said phase calibration calculation unit compares the probe data extracted by said despreading unit and the original probe data inputted to said probe signal generating unit, calculates quantity of distortion given to the probe data extracted by said despreading unit, and calculates the calibration that cancels said quantity of distortion; and

said phase calibration unit calibrates the receive signals based on said

calibration.

24. (new) The radio base station apparatus according to Claim 22, further comprising:

a power control unit that controls power of the probe signal generated by said probe signal generating unit and outputs the probe signal that has been subjected to the power control to said conversion unit.

25. (new) The radio base station apparatus according to Claim 21, wherein:

a spreading rate of said probe signal is larger than spreading rates of other communication signals.

26. (new) The radio base station apparatus according to Claim 20, wherein:

said probe signal is a sine wave.

27. (new) The radio base station apparatus according to Claim 20, further comprising:

an amplitude calibration calculation unit which calculates amplitude calibration required for calibrating amplitude of each receive signal based on the probe signal extracted by said probe signal extracting unit; and

an amplitude calibration unit which calibrates an amplitude of said each receive signal based on the amplitude calibration from said amplitude calibration calculation unit.

28. (new) An array antenna that comprises a plurality of antenna elements and is used for a radio base station apparatus, said array antenna further comprising:

a plurality of input-output terminals corresponding to the plurality of antenna elements;

auxiliary antenna elements, each of which is in weak conjunction with a part of a radiating element constituting each antenna element; and

input-output terminals for probe signal connected respectively to said auxiliary antenna elements.

29. (new) The array antenna according to Claim 28 wherein:

instead of said auxiliary antenna element, each of which is in weak conjunction with a part of the radiating element constituting each antenna element, said array antenna comprises an auxiliary antenna element arranged in a position physically separated from said plurality of antenna elements, and said input-output terminals for probe signal are connected to said auxiliary antenna element.

30. (new) The array antenna according to Claim 28 wherein:

said auxiliary antenna elements are provided within a polygonal prism or a cylinder formed by said antenna elements.

31. (new) A radio base station apparatus provided with an array antenna having a plurality of antenna elements, comprising

a transmitting signal generating unit which generates transmitted signals, and calibrates a phase of each antenna transmitted signals, and adds a spread probe signal for transmission to the phase calibrated signals;

a junction unit which extracts a part of signals produced by the transmitting signal generating unit;

a probe signal extracting unit which despread the signals extracted by the junction unit, and extracts the probe signal for transmission; and

a phase calibration calculation unit which calculates phase calibration required for calibrating a phase of each transmitted signal based on the probe signal extracted by the probe signal extracting unit, and informs the calibration phase to the transmitting signal generating unit.

32. (new) The radio base station apparatus according to claim 31, wherein:
said spread probe signal is added selectively to a specific antenna element.

33. (new) The radio base station apparatus according to claim 31, wherein:
said spread probe signal is spread by a different spread code for each antenna element.